CLAIMS

What is claimed is:

1. A method of moving small samples of liquid through a microscale conduit system, said method comprising the steps of:

a) providing an aliquot of a first liquid sample, said first liquid sample comprising a first solvent;

b) providing a microscale conduit system, said conduit system having an interior wall surface;

c) transferring into said conduit system a carrier liquid that is immiscible with said first liquid sample, wherein said carrier liquid and said first solvent are selected so that said carrier liquid has a contact angle with the interior wall surface of said conduit system more closely approaching zero than the contact angle that said first liquid sample has with said conduit wall surface;

d) causing said carrier liquid to move in said conduit system;

e) transferring said aliquot of said first sample into said conduit system;

f) subsequently, transferring into said conduit system a second aliquot of said carrier liquid; and

g) causing said liquids to continue to move in said conduit system;

wherein at least a section of said conduit system comprises an interior wall surface that is inherently incapable of satisfying the conditions of step c) (an unfavorable surface) and that has applied to it a covalent coating to render said interior wall surface of said section capable of satisfying the conditions of step c) (a favorable surface).

2. The method of claim 1, wherein, further, at least a section of said conduit system comprises an interior wall surface that is inherently capable of satisfying the conditions of step c) (a favorable surface).

3. The method of claim 1, wherein said microscale conduit system comprises a conduit through a microfluidic device.

4. The method of claim 3, further comprising the step of carrying out a processing appropriate to said microfluidic device on said first sample when said aliquot of said first sample has been moved into a position in said device appropriate for said processing step.

5. The method of claim 1, wherein said carrier liquid is a perfluorocarbon.

6. The method of claim 1, wherein said section of said conduit system comprising an interior wall surface that is inherently incapable of satisfying the conditions of step c) (an unfavorable surface) is made of glass or fused silica, wherein said applied covalent coating is a fluoroalkyl silane and wherein said carrier liquid is a fluorocarbon.

7. The method of claim 6, wherein said fluoroalkyl silane is tridecafluoro-1,1,2,2-tetrahydrooctyl-1-trichlorosilane (perfluorooctylsilane, PFOS).

8. The method of claim 1, wherein said applied covalent coating is an alkyl silane.

9. The method of claim 1, wherein said carrier liquid is a fluorocarbon and wherein said coating covalently applied to said interior wall surface of said conduit system in said section having said unfavorable surface is fluorine-rich.

10. The method of claim 2, wherein said section of said conduit system comprising an interior wall surface that is inherently capable of satisfying the conditions of step c) (a favorable surface) comprises Teflon™ tubing and wherein said carrier liquid is a fluorocarbon.

11. The method of claim 1, wherein movement in said conduit system is intermittent.

12. The method of claim 1, wherein movement in said conduit system is continuous.

13. The method of claim 4, wherein said processing step is carried out under stopped flow conditions.

14. The method of claim 3, wherein said microfluidic device is a probe for an NMR spectrometer and wherein said conduit portion through said device includes the observed volume of the detection cell for said NMR probe.

15. The method of claim 1, said method further comprising, following step (f), the steps of;

(f1) providing an aliquot of another liquid sample, wherein said other liquid sample is also immiscible with said carrier liquid;

(f2) transferring said aliquot of said other sample into said conduit system; and

(f3) subsequently, transferring into said conduit system an aliquot of said carrier liquid, wherein said steps f1-f3 may be repeated for different said other samples.

16. The method of claim 15, wherein said other liquid sample comprises the same solvent as said first liquid sample.

17. The method of claim 15, said method further comprising, prior to step f2, the steps of transferring an aliquot of a wash solvent compatible with said first solvent into said conduit system followed by transferring an aliquot of said carrier liquid into said conduit system.

18. The method of claim 4, said method further comprising, following step (f), the steps of;

(f1) providing an aliquot of another liquid sample, wherein said other liquid sample is also immiscible with said carrier liquid;

(f2) transferring said aliquot of said other sample into said conduit system;

(f3) subsequently, transferring into said conduit system an aliquot of said carrier liquid; and

(f4) carrying out said processing step on said other sample when said aliquot of said other sample has been moved into a position in said device appropriate for said processing step, wherein said steps f1-f4 may be repeated for different said other samples.

19. The method of claim 17, wherein said other liquid sample comprises the same solvent as said first liquid sample.

20. A microfluidic device having a microscale conduit therethrough, said conduit having an interior wall surface,

wherein at least a portion of said interior wall surface of said conduit is covalently coated with a fluorine-rich coating.

21. The device of claim 20, wherein said device is made of silicon.

22. The device of claim 20, wherein said device is made of fused silica.